Loan Supply Growth, Recession Expectation and Deficit[i] induced Policy Uncertainty

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Abstract

Using Autoregressive Distributed Lag (ARDL) co-integration framework advanced by Pesaran et al (2001), this study examines short and long run effects of recession expectation, deficit induced policy uncertainty and other modeled variables on loan supply growth. Empirical results based on augmented ARDL bounds test framework confirm existence of significant long run relationship between loan supply growth[ii], recession expectation and budget deficit induced policy uncertainty. Short and long run elasticity estimates following preliminary co-integration analysis further show that percentage change (increase) among study regressors[iii] has varying, but significant negative impact on loan supply growth. Comparative analyses further confirm that modeled regressors tend to have more constraining impact on loan supply growth in the long run than in the short run. This study also finds that among study regressors, heightened inflation expectations tend to restrict loan supply growth more than recession expectations and macroeconomic uncertainty.

Keywords: Loan Supply growth, recession expectation, deficit induced policy uncertainty, ARDL bounds test.

1 INTRODUCTION

Present variety of financial services provided by US Lending Institutions suggests a significant shift from the known historical role as originators of basic financial products, into holistic financial entities offering legion of innovative financial services and products. As these lending institutions transitions and adapts to evolving financial market trends, products and services they offer, have also gone through similar transition. This ability to adapt to changing financial market conditions has made US lending institutions among the most efficient in world; in the offering of products and services central to efficient operation of the entire US financial system and the economy as a whole. Among the legion of services provided by such lending institutions however, credit(loan) supply to potential investors, consumers and existing firms wishing to embark on new projects or expansion, has emerge as a core service around which growth prospect of the US economy revolve. This evolving role as conduits channeling financial resources crucial for economic growth; has made operational activities of lending institutions an important area of study in the ever-expanding finance and economic literature. Most economists; and a growing number of financial analysts for instance, continue to view credit/loan supply or availability as a vital financial service with far-reaching macroeconomic ramifications. For instance, credit availability has been shown to be an important determinant of economic growth and development, through its impact on key performance indicators such as investments and consumption growth. Available literature[iv] focusing on this relationship have also provided strong evidence suggesting that fluctuations in credit supply directly and significantly influence investments and consumption growth. This supporting role of lending institutions through credit supply, coupled with the immense potential to significantly shape core performance indicators critical to economic development, makes dynamics of credit/loan supply growth a relevant area of empirical inquiry. Like most existing studies, this study, seek to augment existing

literature on credit/loan supply growth through its verification of how specific macroeconomic conditions and variables impact US credit/loan supply growth dynamics.

Apart from the growing significance of credit supply growth to the US financial system briefly reviewed above, examination of recent US GDP growth data further highlights such crucial role in economic performance. Reviewed data suggest that access to credit by consumers, existing firms and potential investors has been one of the key features fueling dynamic relationship between consumption/investments patterns, and economic performance. Trend condition analysis conducted by this study focusing on key GDP growth components over the past decade for instance, show growing importance of credit supply and its influence on underlying mechanisms or factors responsible for present US macroeconomic conditions - i.e. post-recession GDP growth. Analysis of present data trend for instance; suggest that if percentage contributions to overall GDP growth[v] by its key components, (eg. investments, consumption etc.) accurately capture or reflects US economic growth dynamics, then ensuring significant credit (loan) supply growth could be the panacea for overcoming sluggishness in present economic growth. This projection stems from the fact that consumption and investment expenditure growth, which accounts for over 75% of the variability in US economic performance according Bureau of Economic Analysis; relies heavily on rate of growth in credit supply or availability of credit supply.

Given this immense importance of loan/credit supply growth to US economic performance, this study is modeled to critically examine the extent to which specific macroeconomic and uncertain conditions or variables, influence the rate of growth in credit supply. Such insight could provide policy makers with array of options on how to accelerate ongoing economic recovery process through credit supply manipulation. This study specifically examines effects of macroeconomic conditions such as recession expectation, policy uncertainty due to growing budget deficit, inflation expectations etc. on loan/credit supply growth; and how by extension, such conditions impacts US economic performance. We project that relative growth or stagnation in credit/loan supply growth due to any of the specific explanatory variables modeled in this study will have significant short and long run impact on consumption and investments growth; with the potential to ultimately constrain or augment US economic performance. This projection[vi] in other words presumes a linear relationship between variability in loan supply growth, consumption and investment growth, and US economic performance; moderated by explanatory variables tested in this study. For instance, if modeled explanatory variables are found to depress loan/credit supply growth, then all things being equal, such trend will also be expected to have significant negative impact on economic performance and vice versa.

1.1 Deficit Induced Policy Uncertainty

Deficit induced policy uncertainty variable introduced in this study is relatively new; and captures uncertainty emanating from growing government budget deficit. The variable defines uncertainty stemming from perceived inability on the part of the government to enact or enforce growth augmenting policies due to persistent budget deficit episodes. Persistent budget deficit episodes in this instance, describes growth in government expenditure over revenue receipts over a prolong period of time. This variable is meant to capture ongoing debates suggesting that such episodes are often perceived as decline in resource base of the federal government; and a weakening in its ability to implement or sustain budget driven growth augmenting policies. Recent debates suggest that such condition can influence crucial investment decisions because of potential mixed signals it conveys among potential investors. For instance, proponents of this view suggest that such condition might generate uncertainty as to whether future deficits motivated policies will be inimical (high taxes) or helpful to investments and businesses. In other words, this variable captures perceived uncertainty regarding the direction of government

macroeconomic policies due to persistent budget deficit episodes. Among lending institutions, deficit induced policy uncertainty is surmised to have the potential to depress loan supply growth because of less informative signals about viability of potential investment projects. That is, for most lending institutions, the likelihood that subsequent fiscal policies due to persistent budget deficit episodes might be inimical to investment performance, thus heightening potential for bad loans, may lead to more conservative behavior on how they extend loans. This study projects that in an economic environment where rational actors anticipate specific macroeconomic policy to be inimical to future operations; such actors (in this instance, lending institutions) will calibrate risk premiums accordingly to compensate for perceived risk associated with such policy. This responds, coupled with other operational adjustments such as stringent loan approval standards, has the potential to constrain loan supply growth; with potential negative impact on investment and consumption growth all things being equal.

However, reviewed literature on how variables modeled in this study ultimately impacts loan supply growth and economic performance, suggests the sequence of causal interactions among the variables in our projection might differs significantly. For instance, whereas a number of related studies acknowledge potential distortions in the interaction between loan supply growth and economic performance, most causal inference studies seem to presume that such interactions are least impacted by conditions to be tested in this study. For example, studies focusing on the effect of credit market (loan supply/demand) on economic growth such as Vazakidis and Adamopoulos (2009) seem to hold prevailing macroeconomic conditions or policies constant in their analysis; an indication that such study either presume limited or no significant influence from conditions modeled in this study. Additionally, a seminal work by Bayoumi and Melander (2008) which concluded that 2.5% reduction in credit supply accounts for about 1.5% reduction in GDP growth, also failed to account for potential effects of macroeconomic distortion parameters being considered in this study. Again, similar studies in the literature that failed to control for such conditions, also seem to presume that such conditions are either constant or have no direct impact on the analysis made. In other words, existing literature seem to be limited on holistic examination of the extent to which key conditions such as recession expectations, budget deficit induced policy uncertainty etc., simultaneously impacts loan supply growth. Nonetheless, it is important to note that some related studies have attempted to control for such distortions by employing dummy variables. Such control methodologies however, are often weak in accurately capturing effects of macroeconomic conditions being modeled in this study. This study, thus, augments existing literature by modeling effects of specific macroeconomic distortions on credit supply growth. The goal as already stated is to verify the extent to which macroeconomic distortions such as perceived policy ambiguity triggered by persistent episodes of government budget deficits, as well as perceived potential for recessionary conditions, influence loan supply growth; and ultimately US economic performance.

2 Deficit Induced Policy Uncertainty and Loan Supply Growth

Present finance and economics literature features varied forms of policy uncertainty variables used to depict how vagueness associated with expected policies impact economic performance and other variables of interest. Studies such as Aizenman and Marion (1993) and Hopenhayn and Muniagurria (1996), have all verified effects of policy uncertainty on growth conditions using different uncertainty parameters. Aizenman and Marion (1983) for instance, showed that policy volatility (modeled as higher dispersion in tax rates) is detrimental to economic growth. However, unlike methodologies employed by Aizenman and Marion (1983), and Baker, Bloom, and Davis, (2012), this study rather focuses on how uncertainty emanating from persistent episodes of government budget deficits and other modeled variables impacts credit/loan supply growth among US lending institutions. Reviewed literature show that empirical estimation of policy uncertainty continues to evolve; and budget deficit induced policy

uncertainty parameter modeled in this study is meant to augment the trend. Deficit induced policy uncertainty variable introduced in this study differs significantly from other economic policy uncertainty variables featured in studies such as Julio, and Youngsuk, (2012), and Baker, Bloom and Davis (2012). The parameter introduced in this study rather relates more to political capacity, and Relative political capacity (RPC) variables originally propounded by Organski and Kugler (1980); and a modified version by Kugler and Arbetman (1997) respectively. Estimation method use in this study also borrows heavily from a version used recently in Abaidoo (2012), which focused on modified version of (RPC) model.

Using this modified method of estimating policy uncertainty based on budget deficit episode, (to be modeled shortly), this study projects that all things being equal, policy uncertainty brought about by persistent episodes of government budget deficits will depress loan supply growth. This conclusion stems from the view that such condition has the potential to bid up prevailing risk premiums on loans; strengthen loan supply qualification requirements; and ultimately depress amount of loans made. These projections further hinges on the belief that persistent episodes of budget deficit induced policy uncertainty might heighten potential for bad loans, making lending institutions more conservative in extending loans to businesses and potential investors.

2.1 Macroeconomic Uncertainty and Loan Supply Growth

Apart from deficit induced policy uncertainty, this study also verifies potential effects of general macroeconomic uncertainty on loan supply growth. To appreciate mechanics of this relationship, it is crucial to understand how asymmetric information impact business decision making process. For most lending institutions, accurately defined or forecasted information on future macroeconomic conditions is crucial in how such institutions make decisions relating to the amount of loan/credit supplied. Unambiguous market information in this instance, allows such institutions to assess potential risk in the market place, and the operational steps required to minimize potential losses emanating from such risk. Consequently, asymmetric information about viability of businesses seeking loans, due to macroeconomic uncertainty, or persistent volatility in prevailing macroeconomic indicators could impact decisions on the volume of loans supplied. In the presence of limited or vague signals on the potential for success or failure for loans, this study project that lending institutions will pursue rational measures to minimize potential default rate on loans. Most prominent among such measures include becoming more conservative in volume of loans extended, or substantial increase in risk premiums which impacts loan demand. In other words, if overall trajectory of the economy is fraught with uncertainty, lending institutions finds it extremely difficult to: (1) accurately evaluate project's viability; (2) assess probability of loan default, and finally, (3) estimate appropriate risk premiums to apply if decisions are still made to extent credit despite uncertain prevailing macroeconomic conditions. Consequently, this study projects that heightened macroeconomic uncertainty or volatility will make potential profitability signals less informative in forecasting for most lending institutions, resulting in significant reduction in volume of loans supplied.

In a study focusing on this association between macroeconomic uncertainty and credit supply, Talavera, Tsapin and Zholud (2006), for instance, showed that banks often make out more loans during periods of economic boom when potential for loan success are high; but curtail or significantly reduce lending when the economy is in recession or during periods of heightened macroeconomic uncertainty. Talavera et al, further found significant negative relationship between bank loan to capital ratio and macroeconomic uncertainty (proxied by conditional variance of producer inflation or volatility in money supply). Additionally, Baum et al (2009) further suggested that macroeconomic uncertainty could have

significant impact on lending strategies of banks by affecting ability of bank managers to accurately predict returns on lending opportunities due to less informative economic signals. Baum et al. additionally surmised that in times of heightened macroeconomic uncertainty, banks are likely to act more homogeneous which might lead to narrower distribution of loan to assets ratios. During periods of minimal uncertainty however, banks tend to exhibits higher propensity to lend, leading to wider bank loan to assets ratios. In a related study looking into impact of uncertainty on lending decisions of banks in Italy, Quagliariello (2009) additionally found negative relationship between macroeconomic uncertainty and dispersion of commercial banks loan-to assets ratio. Again, in an earlier submission on the effects of macroeconomic uncertainty on bank lending behavior, Baum, Caglayan and Ozkan (2002) also showed that in an uncertain macroeconomic environment, banks collectively become more conservative, and this concerted action has the potential to narrow cross–sectional distribution of banks' loan–to–asset (LTA) ratios. Garcia and Calmes (2005) further reach similar conclusion in a study focusing on the Canadian banking system. Using univariate regression analysis, Garcia and Calmes confirmed similar negative relationship between macroeconomic uncertainty and cross-bank variance of loan-to-asset ratio.

2.2 Recession Expectations and Loan Supply Growth

The potential for recession or expectations of significant decline in economic activity in the near future often elicits dramatic responses from various actors in the business community including lending institutions. As already alluded to, key decisions among most lending institutions revolves around forecasts of future performance of loans extended to potential investors and consumers; as well as the economic environment within with such institutions operate. Consequently, projected decline in economic activity or recession expectations could signal significant potential for diminished profitability among lending institutions due to heightened possibility for bad loans. Available evidence suggest that expectations of prolonged decline in economic activity all things being equal, may restrict rate of growth in credit supply; because 'rational' lenders will tighten loan supply due to heightened systematic risk. For instance, in a recent economic brief, Betty Joyce Nash and Kimberly Zeuli[vii], showed that banks reported tighter underwriting standards for firms, especially small firms in post-recession economic environment due to heightened economic risk and expectations of persistent economic slowdown (double dip recession fears). Compared to other variables employed in this study, prior studies focusing on the effect of recession expectations on credit supply growth are limited; this notwithstanding, this study projects that this macroeconomic phenomenon will have significant negative impact on supply of loanable funds.

2.3 Effects of Modeled Macroeconomic Conditions on Economic Performance

2.3.1 Deficit Induced Policy Uncertainty and Economic Performance

As discussed in an earlier submission, budget deficit induced policy uncertainty variable developed in this study is relatively new to the financial economics literature; consequently, empirical studies verifying its impact on economic performance tend to be few and far between. A review of the literature found virtually no study with a variable modeled after this study's definition and approach. The absence of stream of studies employing this variable likely stems from the fact that the view that persistent episodes of government budget deficits could induce some form of macroeconomic related policy uncertainty is still evolving. With limited related studies on how such condition impacts macroeconomic performance, this study only makes projections on the potential impact this condition might have on US economic performance; and verifies the projections in an empirical framework in subsequent sections. Following growing concerns in various print media about the impact of growing US budget deficit on economic

growth, this study makes the following projection: Uncertainty emanating from perceived diminishing government ability to initiate and implement growth fostering policies or enabling macroeconomic environment, will depress economic activities leading to sub-par economic performance. This position hinges on the view that, economic environment characterized by persistent policy uncertainty heightens the potential for constrained investment and consumption growth, which increases the likelihood for anemic economic performance.

2.3.2 Macroeconomic Uncertainty[viii] and Economic Performance

The view that macroeconomic uncertainty exerts significant influence on economic performance among economies around the world, and for that matter the US economy is not new. The condition has been verified; and is highly supported by substantial body of existing empirical literature. Studies such as Bloom et al. (2007) and Bloom (2009) have all provided significant insights on how macroeconomic uncertainty impact economic activity. Bloom et al. for instance confirmed that firms tend to delay investments and other expansion decisions in periods of growing uncertainty about general economic trajectory. Available evidence further show that consumption and investment expenditures decline significantly during periods of growing macroeconomic uncertainty. These conditions suggest that macroeconomic uncertainty indirectly constrain GDP growth through key GDP components such as consumption and investments. According to US Bureau of Economic Analysis, investment and consumption expenditures alone accounts for over 75% of the variability in annual US GDP growth; consequently, understanding factors impacting these key components is crucial in formulating policies aimed at ensuring sustained economic growth. Although existing studies focusing on the association between macroeconomic uncertainty and economic growth diverge somewhat on the direction of causal influence between the variables, the general consensus largely supports negative relationship between the variables.

For instance, in a study focusing on this relationship (macroeconomic uncertainty and economic growth), Asteriou and Price (2005), showed that output volatility or uncertainty greatly reduces investment and economic growth. Additionally, Hnatkovska and Loayza (2004) who studied the growth-volatility relationship using data spanning the period 1960–2000, also found volatility/uncertainty to be inimical to economic growth. Using multivariate GARCH model, Grier *et al*. (2004) further verified effects of growth and inflation volatility on economic performance using post-war US data. Results of this study also confirmed that increasing economic uncertainty significantly lower average growth. Fountas and Karanasos (2007), additionally showed that inflation uncertainty has negative effects on output growth. These conclusions notwithstanding, it important to note that significant number of studies also exists suggesting that macroeconomic uncertainty could have positive impact on economic performance. Andreou *et al* (2008) for instance, showed that output growth uncertainty rather has positive effects on growth conditions among G7 economies. In a related study which also focused on G7 economies, Lee (2010), further provided evidence in support of the view that higher output growth is associated with higher volatility of innovations to growth; in other words, short run growth volatility tend to have positive impact on output growth all things being equal. These analyses suggest significant divergent conclusions on the relationship between macroeconomic uncertainty and economic growth; with much of the differences resulting from how uncertainty parameters in use are modeled. This study however, expects macroeconomic uncertainty to be inimical to economic growth if similar relationship is verified between macroeconomic uncertainty and credit supply growth.

2.3.3 Recession Expectation and Economic Performance

Recession expectation, defined as condition where actors in an economic environment (businesses, consumers etc.) anticipates significant decline in economic activity, is also projected to impact key components of GDP growth. Recession expectation in this instance is theorized to be inimical to investments and consumption growth; through projected constraining effects on loanable funds available to potential investors and consumers. As noted earlier, this study is of the view that in order to minimize potential losses due to projected imminent decline in economic activities, rational economic actors (lending institutions), will restrict credit to major sectors of the economy to fuel expected growth. Such rational adjustments in the form of higher risk premiums or stringent lending requirements, coupled with potential decline in demand for credit among consumers and potential investors, is expected to ultimately depress economic growth all things being equal.

Various projections made above relating to how modeled variables influence loan supply growth, and ultimately economic growth, are verified in an econometric framework in the following sections. The rest of this study is organized as follows. Section 3 presents theoretical framework for estimating budget deficit induced policy uncertainty and macroeconomic uncertainty variables use in this study. Section 4 describes data sources and key variables tested in the study as well as econometric model employed. Section 5 presents empirical results of this study; and section 6 discusses results and potential policy implications of the results.

3 Estimating Episode of Budget Deficit Induced Policy Volatility: The Model

A number of estimation methods have been proposed in the ongoing attempt to estimate policy uncertainty emanating from how government manages its resources; and how actions involve are perceived by key actors in an economy. Notable among these is the relative political capacity (RPC) approach propounded by Organski and Kugler (1980); and an augmented version by Kugler and Arbetman (1997). Using a framework which borrows from these earlier studies, this study models a version of policy uncertainty based on persistent episodes of government budget deficits. The goal is to verify recent debate in some media outlets suggesting that, persistent episodes of government budget deficits generates uncertainty among current and potential investors, leading to slower than expected economic growth. The framework employed in this study captures perception of uncertainty due to declining capacity on the part of the government to successfully enact and implements growth augmenting policies. This form of uncertainty is modeled as follows:

$$\delta(n , \mu) = 1-[(1- (Pr_t(Л_{t+1}) < \mu))\ldots\ldots(1- (Pr_t(Л_{t+n}) < \mu))] \quad (1)$$

Where:

$\delta(n , \mu)$ = Denote episode of deficit induced policy uncertainty in ***n*** period at a given quarterly government revenue level (μ).

$(Л_{t+1})$ = Expected Government expenditure

$(Pr_t(Л_{t+1}) > \mu)$ = Deficit induced policy uncertainty episode; i.e. probability of government expenditure exceeding revenue

$(1- (Pr_t(Л_{t+1}) > \mu)$ = No episode of deficit induced policy uncertainty; since subtracting an episode of deficit induced policy uncertainty

($Pr_t(Л_{t+1}) > \mu$), from 1 leaves episode of certainty.

(1− ($Pr_t(Л_{t+n}) > \mu$) = Indication of no episode of deficit induced policy uncertainty in the n^{th} time period.

In equation 1, subtracting periods of no episode of deficit induced policy uncertainty from 1, ultimately leaves condition or instance of deficit induced policy uncertainty episode. In other words, equation 1 postulates that, conditions of budget deficit induced policy uncertainty exist when present and expected government expenditures exceed revenue receipts. This condition is believed to be perceived as diminishing ability on the part of the government to foment desired policies necessary to sustain growth augmenting economic policies.

3.2 Econometric Framework

3.2.1 *Modeling Macroeconomic Uncertainty*

Present studies showcase evolution of proxies employed in attempts to capture uncertainties associated with extreme fluctuations among macroeconomic indicators. Proxies employed in related studies ranges from standard deviation of specific time series variable such as GDP growth rate, inflation etc.; and a growing trend based on generalized autoregressive conditional heteroscedastic model *(garch)* as used in Driver et al. (2004) and Byrne and Davis (2002) respectively. This study employs similar *garch* process in estimating macroeconomic uncertainty as perceived by lending institutions. Macroeconomic uncertainty parameter in this instance is modeled as a conditional variance of US productivity (GDP growth); and captures variability associated with growth dynamics on quarterly basis. This approach captures volatility/uncertainty associated with US output performance. A generalized ARCH *(garch)* model for GDP growth, covering the period 1960 to 2010 is considered in this study. Generalized arch function capturing volatility associated with US productivity is modeled as follows:

$$h_t = \omega + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 h_{t-1} \tag{2}$$

Equation 2 can further be transformed into a garch (p, q) process in the form:

$$h_t = \omega + \sum_{j=1}^{p} \alpha_j \varepsilon_{t-j}^2 \sum_{k=1}^{q} \beta_k h_{t-k}^2 \tag{3}$$

Where, $\alpha_1 \ldots \alpha_p$ and $\beta_1, \ldots, \beta q$ are all nonnegative; and $\omega > 0$,

3.3 *Data and Variables*

Data on US credit/loan supply growth and other variables employed in this study are sourced or modeled from data sourced from FRED (St. Louis Fed) and Bureau of Economic Analysis database respectively. Data employed in this study is made up of quarterly time series variables spanning the period 1960 and 2010. Key variables used in this test include, budget deficit induced policy uncertainty variable *(dipu),* modeled using previously defined framework which captures persistent disparities between government revenues and expenditures*;* loan/credit supply growth *(cls),***,** bank prime lending rate

(*bplr),* macroeconomic uncertainty parameter (*macun)* estimated from GDP growth through garch process, inflation expectations ***(****inflex), and* Recession Expectation *(rcpr).*

4. Dynamics of US Loan Supply Growth

4.1 Model Specification*: ARDL - Bound Test Approach*

Autoregressive distributed lag (ARDL) model, a bounds test technique is used in verifying various projections made in this study. Bounds test approach is preferred because the technique possesses some estimation advantages. According to Pesaran *et al*. (2001), unlike the Engle-Granger (1987) and Johansen-Juselius (1990) cointegration procedures which require respective time series variables to be integrated in *I(1)* order, ARDL bound test approach allows for level relationship estimation using both *I(1)* and *I(0)* time series data. The approach has further been shown to be ideal for estimating conditions in cases where either small or large sample data is in use. Additionally, bound test approach to autoregressive distributed lag (ARDL) estimation further allows for simultaneous modeling of short and long run effects using short and long run elasticity estimates. Conditional ARDL-Error Correction Model estimating effects of stated variables on loan supply growth in this study is modeled as follows:

$$\begin{aligned}\Delta(cls)_t = \alpha_0 &+ \sum_{i=1}^{p}\phi_i\Delta(cls)_{t-i} + \sum_{i=0}^{p}\theta_i\Delta(dipu)_{t-i} + \sum_{i-0}^{p}\varepsilon_i\Delta(inflex)_{t-1} \\ &+ \sum_{i=0}^{p}\lambda_i\Delta(rcpr)_{t-i} + \sum_{i=0}^{p}\varphi_i\Delta(bplr)_{t-i} + \sum_{i-0}^{p}\mu_i\Delta(macun)_{t-1} \\ &+ \sum_{i-0}^{p}\pi_i(cls)_{t-1} + \delta_1(dipu)_{t-1} + \delta_2(inflex)_{t-1} + \delta_3(rcpr)_{t-1} \\ &+ \delta_4 bplr)_{t-1} + \delta_5(macun)_{t-1} + \upsilon_t\end{aligned} \tag{4}$$

where *(cls),* constitutes the main dependent variable, credit or loan supply growth; and (*dipu), (inflex), (rcpr),* (*bplr*), and (*macun*) are the tested independent variables. Δ is first-difference operator; *p* the optimal lag order in empirical analysis and $_{t-1}$ etc. the lag operators. Equation 4 estimates long-run relationships between specified independent variables and loan supply growth using *F*-test estimation framework. This procedure which is modeled through ARDL framework, test the null hypothesis of no cointegration in the form:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$$

Against the alternative hypothesis

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq \delta_5 \neq 0$$

F-test analysis used in this section as part of ARDL framework takes into consideration the following conditions; the number of regressors modeled in the study; and whether the model contains an intercept and/or trend. Given the duration of quarterly data employed (1960-2010), this study opts for bounds test critical values suggested by Narayan (2004) instead of those propounded earlier by Pasaran et al (2001) which dominates related studies in the literature. Critical bound values proposed by Narayan (2004) are preferred because it's suitable for relatively smaller data sets. Bound critical values proposed by Pasaran et al (2001) on the other hand, has been shown to underestimate bound range values for small sample data because of its orientation which favor's relatively larger sample data set (at least 500-1000 data points). Using critical value bounds proposed by Narayan (2004), two sets of critical values relating to whether variables in treatment are I(1) or I(0) with a corresponding alpha level, and number of regressors are adopted. Critical values for the I(1) series in this case denotes *upper* bound critical value, while the

critical values for I(0) series captures *lower* bound critical value. Given such critical value bounds, if estimated *F*-test statistic is found to exceed respective upper bound critical value, the condition, all things being equal, will provide strong evidence of long-run relationship between dependent and independent variables in this study irrespective of the order of integration of variables involve. On the other hand, if estimated test statistic is found to be below the lower critical value, then the null hypothesis of no cointegration between respective variables cannot be rejected. However, if computed test statistic is found to be between the lower and upper bounds values, then no conclusive inference can be made without knowing the order of integration of underlying study regressors.

If the presence of cointegrating or long-run relationship between credit supply growth and stated explanatory variables is verified using proposed ARDL framework, a short-run dynamic relationship can further be verified using an error correction version (*ECM*) of equation 4 as follows:

$$\Delta(cls)_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta(cls)_{t-i} + \sum_{i=0}^{p} \theta_i \Delta(dipu)_{t-i} + \sum_{i-0}^{p} \varepsilon_i \Delta(inflex)_{t-1} + \sum_{i=0}^{p} \lambda_i \Delta(rcpr)_{t-i} + \sum_{i=0}^{p} \varphi_i \Delta(bplr)_{t-i} + \lambda ECM_{t-1} + \upsilon_t \quad (5)$$

where, ECM_{t-1} is the error correction term which helps in understanding the rate of adjustment to equilibrium following a conditional deviation from trend. These long and short run relationships are estimated in the subsequent sections.

5. Empirical Estimation

5.1 *Unit Root Test*

Bounds test procedure adopted in this study provides significant results irrespective of the order of integration of underlying explanatory variables. This notwithstanding, it is still important to verify the order of integration in order to understand specific trend features associated with individual variables used in the study. Additionally, it is also crucial to verify the order of integration because of the likelihood of having estimated F-test statistic which falls between adopted critical bound values in cointegration estimation. This section utilize both the Augmented Dickey-Fuller (1981) (ADF) test and the Phillip-Perron (1988) (PP) test to verify stationary characteristics of variables employed in the study. Optimal lag order used for the ADF test is based on (SBIC) criterion. Unit root tests verifying trend characteristic of individual variables are reported in Table 1. Test statistics coefficients show variables employed in this study are stationary in both tests using reported optimal lag order.

Table 1 Univariate Stationary Properties

	ADF Test	Philips Perron Test		
Variables	Optimal Lag Order	Test Statistics	Newey-West lags	Z(t) tau Statistics
CLG	2	-7.566***	4	-12.64***
BLR	2	-4.436***	4	-4.285***
RECPr	2	-8.981***	4	-16.97***
NFEXP	2	-5.513***	4	-4.674***
BDIPU	2	-9.163***	4	-13.85***
MACUN	2	-6.657***	4	-10.03***

5.2 Results of Bound Test for Cointegration

Having verified stationary properties of variables in treatment, this section further estimates potential cointegrating relationships between loan/credit supply growth and stated independent variables in the study. Table 2 report computed F-test statistic coefficient use in verifying the null hypothesis of no long-run relationship or cointegration between loan supply growth and the various independent variables using critical bound values propounded by Narayan (2004) for relatively small data sets. The F-test statistic value reported in table 2 significantly exceeds the upper critical bound value at 1%, 5% and 10% significance level respectively; a condition which indicates the null hypothesis of no cointegration between respective independent variables and the only dependent variable in the study can be rejected in support of long run relationships among the variables.

Table 2 Bound Test for Cointegration

Test Statistic	Value	Level of Significance	Lower Bound Critical Value	Upper Bound Critical Value
F-Statistic	**23.55**		**I(0)**	**I(1)**
		1%	3.42	4.88
		5%	2.55	3.71
		10%	2.17	3.22
K=6				

Critical values sourced from Narayan **(**2004), Case II

6 Examining Short and Long Run Dynamics of Loan/Credit supply Growth

6.1 *Short Run and Long Run Analysis*

Applying augmented bound test analysis, this section verifies short and long run interactions between loan supply growth and individual independent variables modeled in equations (4) and (5). Following methodology employed in Bardsen, (1989) and Atif et al (2010) respectively, short and long run elasticities estimating effects of modeled explanatory variables on loan supply growth are examined. The goal is to verify the extent to which percentage change (growth) in specific independent variable impact credit or loan supply growth among US lending institutions. Table 3 report coefficients and standard errors estimates of short run elasticities characterizing paired relationships between key independent variables and loan supply growth. Reported short run error correction term (EC_t), show that distortions in the relationship between stated independent variables and loan supply growth are not restored or corrected as quickly as this study anticipated. Error correction coefficient of (-.454) suggest the correction process is fairly slow. This condition to some extent, could explain why constraining effects of modeled independent variables on credit supply growth; and economic performance tend to persist over several quarters.

Table 3 Short run elasticity

Variables	Coefficients	Standard Errors
$D.BLR_{t-2}$	-2.72*	0.10
$D.RECPr_{t-1}$	-0.59***	0.01
$D.INFEXP_{t-1}$	-6.09***	0.15
$D.BDIPU_{t-1}$	-1.40**	0.04
$D.MACUN_{t-1}$	-3.71*	0.14
EC_{t-1}	-0.45***	0.14

6.2 *Loan Supply Growth: Short Run Analysis*

Coefficient estimates of short run elasticities in table 3 captures effects of modeled independent variables on loan supply growth. Reported results show that individual explanatory variables tested (recession expectations, inflation expectations, deficits induced policy uncertainty etc.) have varying constraining impact on credit/loan supply growth. For instance, coefficient estimates show that percentage increase in bank prime lending rate decreases loan supply growth by approximately 2.72%. Test results further indicates recession expectations (probability); that is, expectation of significant decline in economic activities also has significant negative impact loan supply growth. A percentage increase in recession expectations; or potential for imminent recessionary conditions results in 0.59% decline in loan supply growth among lending institutions. This outcome suggests that in the short run, expectation of impending recession does not gravely impact loan supply growth compared to other variables tested. Additionally, this study also finds that in the short run, inflation expectation is the only variable or condition with the most significant constraining impact on loan supply growth in the US economy. Results show that percentage increase in inflation expectation all things being equal, could be responsible for about 6% decline in loan supply growth; a highly significant decline than this study expected.

This study further finds that episodes of budget deficit induced policy uncertainty, which captures uncertainty emanating from perceived weakness on the part of the government to implement growth augmenting policies could also constrain loan supply growth. Coefficient estimates show that percentage growth in deficit induced policy uncertainty, all things being equal, decreases loan supply growth by approximately 1.4%. Finally, coefficient estimates further corroborate findings of existing studies suggesting that, in the short run, macroeconomic uncertainty, (modeled as conditional volatility in general GDP growth) has constraining effect loan supply growth. Percentage increase (worsening) in the condition (macroeconomic uncertainty) is found to be responsible for 3.71% decline in loan supply growth. These results altogether, show that in the short run, a percentage increase in modeled explanatory variables or conditions tested, have significant negative impact on the volume of loanable funds made available to the general public.

6.3 *Loan Supply Growth: Long Run Analysis*

In addition to short run effects examined above, this section verifies if similar or varied conditions persist in the long run. Empirical results reported in table 4 shows that loan supply growth respond differently to variability in independent variables tested in the long run. Reported coefficient estimates for instance, show that in the long run, a percentage change in prime loan rate (interest on loans) has no statistically significant impact on the volume of credit or loans made. Long run estimates in table 4 further confirms one of the key conditions found in earlier short run analysis; that is, inflation expectations is the dominant condition with the most significant constraining impact on loan supply growth. Coefficient estimate associated with the variable for instance, suggests that a percentage rise in inflation expectations or impending persistent rise in general price level, could result in as much as 10% decline in loan supply growth. Additionally, this study also finds that recession expectations, budged deficit induced policy uncertainty and macroeconomic uncertainty all exerts negative influence on loan supply growth in the long run. Comparative analysis, between reported long run coefficients associated with tested variables and prior short run estimates, show that, modeled explanatory variables tend to have more constraining effects on loan supply growth in the long run than in the short run. Reported long run elasticity coefficients for instance, suggest that a percentage increase in recession expectation (probability), budget deficit induced policy uncertainty and macroeconomic uncertainty results in 1.6%, 5.5% and 9.7% decline in loan supply growth respectively. These estimates suggests relatively significant decline than results reported in table 3. Over all, above conclusions suggest that if industry specific factors are held constant, loan supply growth among lending institutions tend to experience significant decline in periods of grave macroeconomic conditions (uncertainty and expectations) such as those modeled in this study. Table 4 reports long term effects of modeled explanatory variables on loan supply growth.

Table 4 Long run elasticity

Variables	Coefficients	Standard Errors
$D.BLR_{t-2}$	2.77	0.060
$D.RECPr_{t-1}$	- 1.56***	0.011
$D.INFEXP_{t-1}$	-10.24**	0.085
$D.BDIPU_{t-2}$	-5.50**	0.052
$D.MACUN_{t-1}$	-9.86*	0.142

6.4 Effects of loan supply growth on US Economic Performance – A deductive Approach

Above empirical analysis verified how modeled explanatory variables influence loan supply growth using augmented ARDL Bound test approach. This section, deductively analyze potential effects of modeled variables on US economic performance. Deductive analysis adopted in this section calls for existence of two empirically verifiable conditions. The first condition, a verified relationship between modeled explanatory variables and loan supply growth was satisfied in the empirical portion of this study. The second condition on the other hand calls for empirically verified direct relationship between loan supply growth and economic performance; for this second condition, this study relies on empirical evidence from existing studies focusing on the relationship. In this deductive analysis, if modeled explanatory variables are shown to constrain loan supply growth; and conclusive empirical evidence also exist supporting direct relationship between loan supply growth and economic performance; then it could be concluded that modeled explanatory variables will have constraining effect on economic growth all things being equal.

Reviewed studies focusing on the link between credit/loan supply growth and economic performance shows significant cross-country heterogeneity in how credit/loan supply impacts economic growth; this notwithstanding, existing evidence overwhelmingly supports significant positive correlation between the two variables. Bayoumi and Melander (2008), for instance found significant direct relationship between credit supply and economic growth; researchers in this study showed that 2.5 percent reduction in credit supply generates 1.5 percent reduction in GDP growth. Additionally, Shan and Jianhong (2006) who verified potential causal relationship between the variables in question also confirmed direct causal relationship between financing/credit supply and economic growth. In a 2008 IMF Global Financial Stability Report, researchers again showed that credit supply growth has statistically significant impact on GDP growth. Specifically, the IMF report revealed that credit squeeze and credit crunch, spread evenly over three quarters, reduces GDP growth by about 0.8% and 1.4% points respectively assuming no other supply shocks to the system. Following these conclusions, this study surmise that, all things being equal, a percentage change (increase) in modeled explanatory variables will, by extension have significant impact (constraining effects) US economic performance. In other words, above analysis suggests that a percentage increase in key explanatory variables modeled in this study could also have depressing effects on economic growth.

6.5 Conclusion and Policy Implication

This study verified effects of non-industry specific conditions/factors on supply of loanable funds among lending institutions in the US. Using augmented ARDL-Bound test framework, this study finds that loan supply growth, a key variable responsible for significant variability in consumption and investments growth, can be constrained significantly by explanatory variables employed in the study. Empirical results show that expectations of recessionary conditions, macroeconomic uncertainty, inflation expectations, policy uncertainty due to growing budget deficits, and percentage increase in prime lending rate, negatively impact loan supply growth. For instance, test results suggest a percentage increase in each explanatory variable negatively impact the volume of loanable funds supplied in the short run; with the most significant decline in loan supply occurring during periods of heightened inflation expectations. Long run analyses however, show that a percentage increase in prime lending rate has no significant impact on loan supply growth. Additionally, this study also finds that a percentage increase in employed explanatory variables[ix] tend to have more constraining effects on loan supply growth in the long run than

in the short run. Reported long run elasticity coefficient estimates show a much greater decline in loan supply growth in the face of heightened recession expectations or inflation expectations than effects found in the short run analysis.

These findings, to some degree demonstrate that non-institution on industry specific factors or conditions such as those modeled in this study have significant impact on loan supply growth. Subsequent deductive analysis also suggests that relationships verified above, could ultimately influence variability in US economic growth; and the need for policies that exudes certainty. Results additionally suggest that in order to ensure sustained economic growth, policy makers must ensure that policy actions offer some form of forward guidance to reduce uncertainty among economic actors.

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[i] Refers to Budget Deficit induced policy uncertainty as perceived by lending institutions, potential investors and consumers

[ii] Loan supply and credit supply are used interchangeably to reference volume of total loan made by lending institutions.

[iii] Independent variables test in the study

[iv] To be reviewed in subsequent sections

[v] As documented by Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS) respectively

[vi] Impact of loan supply growth on US economic performance.

[vii] (Feb 2011- Federal Reserved of Richmond Economic Brief)

[viii] The term uncertainty and volatility are used interchangeably in this study

[ix] Excluding prime lending rate variable

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